

# Humdrum File Format

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# Humdrum File Format

- Humdrum file format is analogous to XML: organizing structure for data without concern for content.
- Each data stream is a column of data (called a *spine*) started by an **exclusive interpretation** which is two stars followed by the data-type name. The end of the data is marked with star-minus (not star-underscore as it may seem in the Courier font).
- Temporal: organized strictly time-wise in the data: each succeeding row comes after the preceding (contrasts with all other polyphonic data formats except MIDI Type-0 files).
- Each element on a data line occurs simultaneously in time (a4, b4, c4 occur at the same time).

spine			
**AAA	**BBB	**CCC	exclusive interpretation (data type)
a1	b1	c1	} data
a2	b2	c2	
a3	b3	c3	
a4	b4	c4	
a5	b5	c5	
* _	* _	* _	spine terminators (data end)

# Field Separator/Null Records

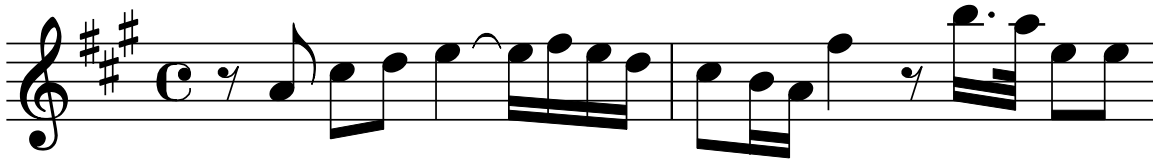
- Each field on a line is separated by exactly *one tab character* (may cause vertical alignment aberrations in a text editor if a field is wide).
- If one spine has no event when others do, a **null token** (".") is used as a place holder to indicate that the previous item in the spine is still in effect.

**AAA	**BBB	**CCC	
a1	b1	c1	← all spines have an event
.	.	c2	← c2 occurs by itself
a2	.	.	← a2 occurs by itself
a3	.	c3	← a3 and c3 occur together
a4	b2	c4	← all spines have an event
*_	*_	*_	

# Motivation for Humdrum format

- Reaction against the linear parsing needed in DARMS code

8-'A{"CD}4E+{6EFED}/{8C'6BA}"4F8-{6.B3A}{8EE}/



- Spreadsheet model for processing the data.

	A	B	C
1	**AAA	**BBB	**CCC
2	a1	b1	c1
3	.	.	c2
4	a2	.	.
5	a3	.	c3
6	a4	b2	c4
7	*_	*_	*_
8			

- Increased random access (e.g., no sticky settings for rhythm/octave like DARMS/Guido/Lilypond/ABC) for better **regular-expression** parsing.

\*\*kern  
 \*clefG2  
 \*k[f#c#g#]  
 \*M4/4  
 \*met(c)  
 =1-  
 8r  
 8a  
 8cc#  
 8dd  
 [4ee  
 16ee]  
 16ff#  
 16ee  
 16dd  
 =2  
 \*\_

# Spine Manipulators

**datatag	Exclusive interpretation
*^	Spine split (into two sub-spines)
*v	Spine merge (contiguous spines merge)
*x	Spines exchange column positions (rare)
*+	Add new spine
*_	Spine terminator (end of data for spine)
*	Null interpretation (null manipulator)

column 2	spine 2	sub-spines	sub-tokens
<b>**a</b> <b>**b</b> <b>**c</b> a b c a b c * *^ * a b1 b2 c a b1 b2 c *^ * * * a1 a2 b1 b2 c a1 a2 b1 b2 c * * *v *v * *v *v * * a b c a b c *- *- *-	<b>**a</b> <b>**b</b> <b>**c</b> a b c a b c * *^ * a b1 b2 c a b1 b2 c *^ * * * a1 a2 b1 b2 c a1 a2 b1 b2 c * * *v *v * *v *v * * a b c a b c *- *- *-	<b>**a</b> a a * a a *^ 1 2 a1 a2 a1 a2 * * *v *v a a *-	<b>**a</b> subtoken a 1 2 3 a a1:a2:a3 *-  <b>**kern</b> 4c 4d subtoken 4d 1 2 3 4f 4a 4cc 4g *-

# Record (line) Types

**Comments (starting with !)**

**Reference Record** (bibliographic record):

!!!key: value

**Global Comment:**

!!unstructured text

**Local Comment:**

!text

**Interpretations (starting with \*)**

**Spine Manipulators** (fixed set):

\*\*start, \*^, \*v, \*x, \*+, \*-

**Tandem Interpretations** (data-type dependent):

\*clefG2, \*M4/4, \*MM=120

**Null interpretation** (place-holder for empty interpretation)

\*

**Barline (starting with =)**

technically a form of data in Humdrum (should be interpretation)

**Data line (starting anything else)**

# Reference Records

!!!COM: Mozart, Wolfgang Amadeus

!!!CDT: 1756/01/27/-1791/12/05/

!!!CNT: German

!!!OTL: Piano Sonata No. 16 in B-flat major

!!!SCT: K 576

!!!OMV: Mvmt. 2

!!!OMD: Adagio

!!!ODT: 1789///

COM = Composer:	Mozart, Wolfgang Amadeus
CDT = Composer's dates:	27 Jan 1756 - 5 Dec 1791
CNT = Nationality:	German
OTL = Title:	Piano Sonata No. 16 in B-flat major
SCT = Scholarly cat. num.:	K 576
OMV = Movement number:	Mvmt. 2
OMD = Movement designation:	Adagio
ODT = Date of composition:	1789

# **\*\*kern**

- **\*\*kern** = exclusive interpretation (data type) which represents the “core” (in German) of musical data.
- Primary data format for storing music in Humdrum files.

```
**kern      **text  
*M4/4      *  
=-         =-  
1c        Hello world!  
==         ==  
*_         *_
```





# Tandem interpretations for \*\*kern

- \*clefG2 = treble clef (G clef on second line from bottom of staff)
- \*clefGv2 = vocal tenor clef (G clef on second line, notes transposed down an octave)
- \*clefF4 = bass clef (F clef on fourth line from bottom of staff)
- \*clefC3 = alto clef
- \*MM120 = tempo marking (120 beats per *quarter* note)
- \*k[f#c#g#] = key signature of A major/F# minor
- \*A: = music is in A major
- \*f#: = music is in F# minor
- \*k[b-e-a-d-g-c-f-] = key signature for C-flat major
- \*C-: = music is in C-flat major
- \*M3/4 =  $\frac{3}{4}$  meter
- \*met(c) = common time
- \*met(c|) = cut time
- \*met(O) = circle mensuration

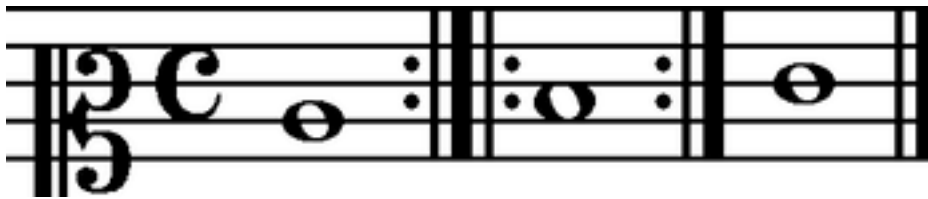
# Pitch and Rhythm

c = middle c (C4)  
cc = octave higher (C5)  
ccc = two octaves higher (C6)  
C = octave lower (C3)  
CC = two octaves lower (C2)  
B = minor second below c  
b = major seventh above c  
c# = c-sharp  
c- = c-flat  
c## = c-double sharp  
c-- = c-double flat  
r = rest

4 = quarter note  
8 = eighth note  
16 = 16<sup>th</sup> note  
32 = 32<sup>nd</sup> note  
64 = 64<sup>th</sup> note  
2 = half note  
1 = whole note  
2. = dotted half note  
4.. = double dotted quarter note  
12 = triplet eighth note  
20 = quintuplet sixteenth note  
3%2 = triplet whole note (extension)

# Barlines

=	plain barline
=23	barline #23
=23;	barline #23 with a fermata over it
=-	invisible barline
=: !	left-pointing repeat barline (  = light line, !=heavy line).
=: ! :	left-right repeat barline
==	double (final) barline
='	partial mid barline
=`	partial top barline



```
**kern
*clefC2
*M4/4
*met(c)
=-
1c
=2:|!|:
1d
=3:|!
1e
==
*_
```

# Stem directions

\*\*kern

\*M3/4

\*k[f#]

=-

4g/

4g\

4g/

=2

4g\

4g/

4g\

=

4g/

4g\

4g/

==

\*\_

/ = stem up

\ = stem down



# Beams and Ties/Slurs

L = start of beam line

J = end of beam line

LL = start of two beam lines

JJ = end of two beam lines

K = right facing partial beam

k = left-facing partial beam

[ = start of tie

\_ = middle note in tie (continues in both directions from printed note.

] = end of tie

( = beginning of slur

) = end of slur

{ = beginning of phrase

} = end of phrase

\*\*kern

\*M4/4

\*k[f#]

=-

{8c/L

8d/J

8.e/L

16f#/Jk

16g/LK

8.a/J

16g/LL

16f#/

16e/

16d/JJ}

=

(8c/L

16d/L

16e/JJ)

[4f#

4f#\_

4f#];

==

\*\_



# Multiple parts

!!!COM: Landini, Francesco

!!!OTL: Excerpt from Non avr&agrave; ma' piet&agrave;

**\*\*kern \*\*kern \*\*kern**

\*clefF4      \*clefG2      \*clefG2

\*M3/4                      \*M3/4                      \*M3/4

[illegible]

4A                      4e                      8eL

8fJ

4B- 4d 8g

4 f#

4A 4C#

8e

\_\_\_\_\_

2.G                      2.d                      2.g

\_\_\_\_\_

\* \_                      \* \_                      \* \_

!!muse2ps: z21jw1500

Excerpt from *Non avrà ma' pietà*  
 Francesco Landini



## Null tokens

# KernScores

<http://kern.ccarh.org>



A library of virtual musical scores in the Humdrum **\*\*kern** data format.  
Total holdings: 7,866,496 notes in 108,703 files.

search:   
[browse](#) | [shortcuts](#)  ☐ anchored

[A guided tour of the KernScores website](#)  
[Recent additions to the KernScores library](#)  
[Data Collection Highlights](#)

[Online Humdrum Editor](#)  
[CCARH Humdrum Portal](#)  
[Contribute kern scores](#)

## Composers

Adam	Chopin	Giovannelli	Lassus	Schubert
Alkan	Clementi	Grieg	Liszt	Schumann
J.S. Bach	Corelli	Haydn	MacDowell	Scriabin
Banchieri	Dufay	Himmel	Mendelssohn	Sinding
Beethoven	Dunstable	Hummel	Monteverdi	Sousa
Billings	Field	Isaac	Mozart	Turpin
Bossi	Flecha	Ives	Pachelbel	Scarlatti
Brahms	Foster	Joplin	Prokofiev	Vecchi
Buxtehude	Frescobaldi	Josquin	Ravel	Victoria
Byrd	Gershwin	Landini	Scarlatti	Vivaldi
				Weber

## Genres

Ballate	Etudes	Motets	Scherzos	Symphonies
Ballads	Fugues	Preludes	Sonatas	Virelais
Chorales	Madrigals	Ragtime	Sonatina	Waltzes
Contrafacta	Mazurkas	Quartets		

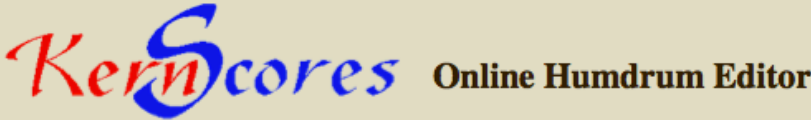
Database of Humdrum files containing  
**\*\*kern** data.

- <http://kern.humdrum.org/help/tour>
- <http://kern.humdrum.org/cgi-bin/kseditor>

# Online Humdrum Editor

<http://kern.humdrum.org/cgi-bin/kseditor>

Very simple interface to some of the Humdrum tools



Note: only works with Firefox web browser

input

```
**kern
*clefC2
*M4/4
*met(c)
_
1c
=2:|!|:
1d
=3:|!
1e
==;
*_
_
```

output

Input URL:    (using one of the actions listed below)

Actions:

☒ Notation  
(via *hum2muse*)

☐ PDF, ☐ PNG: ☒ anti-aliased ☐ aliased, ☐ MuseData  
transparent background: ☐ zoom factor for PNG:  (use 3.0 for print publications)  
music compression factor:  (larger value for more space, smaller value for denser music)  
*For images used in print, set zoom factor to 3, and uncheck transparent background option.*

☐ Notation  
(via *hum2abc*)

☐ PDF ☒ PNG ☐ GIF (not anti-aliased) zoom factor for PNG & GIF:

☐ MIDI

bend depth:

☐ Census

☐ include \*\*kern information

☐ Transpose

☐ MEI

☐ Extract

remove spine number

☐ Freeform



# E button on KernScores

```

!!!COM: MacDowell, Edward
!!!CDT: 1860/12/18/-1908/01/23/
!!!OPR: Second Modern Suite, Op. 14
!!!ODT: 1882///
!!!OTL: Dance of Fantasy
!!!OPS: Op. 14
!!!ONM: No. 5
**kern **kern
*staff2 *staff1
*lpiano *lpiano
*clefF4 *clefG2
*k[f#c#g#] *k[f#c#g#]
*A: *A:
*M2/4 *M2/4
*MM152 *MM152
=1- =1-
8AA'\L 8r
8E'\ 8c#\ 4ee^\ 4eee^\
8AA'\
8E'\ 8c#\J 8e'/ 8ee'/
=2 =2
8AA'\L 16ff#\LL
. 16ee#\
8F#\ 8d'\ 16ff#\
8AA'\ 16aa'\JJ
8AA'\ 16gg#\LL
. 16ff#\
8Fn'\ 8d'\J 16gg#\
. 16bb'\JJ
=3 =3
8AA'\L 8r
8E'\ 8c#\ 4ee^\ 4eee^\
8AA'\
8E'\ 8c#\J 8e'/ 8ee'/
=4 =4
8AA'\L 16ff#\LL
. 16ee#\
8F#\ 8d'\ 16ff#\
8AA'\ 16aa'\JJ
8AA'\ 16gg#\LL
. 16ff#\
8Fn'\ 8d'\J 16gg#\
. 16bb'\JJ
=5 =5

```

```

*^ *^
4e/ 8e\ 16aa/LL 8r
. . 16ccc#\
. 8r 16aa/ 8f#\ 8a'\ 8cc#\
. 16ff#/JJ
4d#/ 8d#\ 16cc#/LL8r
. 16dd#\
. 8r 16ff#/ 8f#\ 8a'\
. 16aa/JJ
=6 =6 =6 =6
4c#/ 8c#\ 16aa/LL 8r
. 16ccc#\
. 8r 16aa/ 8d#\ 8f#\ 8a'\
. 16ff#/JJ
4B/ 8B\ 16cc#/LL8r
. 16dd#\
. 8r 16ff#/ 8d#\ 8f#\ 8a'\
. 16aa/JJ
*v *v *v
* *v *v

```

```

=7 =7
4E'\ 4B'\ 4g#\ 16ff#\LL
. 16ddd\
. 16bb\
. 16gg#\JJ
4r 16ff#\LL
. 16dd\
. 16b\
. 16g#\JJ
=8 =8
8EEE'/ 8EE'/ 16f#\LL
. 16d/
8r 16b/
. 16G#\JJ
16F#\LL 4r
16D/
16BB/
16GG#\JJ
=
*_
!!!ENC: Craig Stuart Sapp
!!!END: 2008/07/15/
!!muse2ps: i0l1c70

```

Dance of Fantasy Edward MacDowell

# KernScore Browse

<http://kern.ccarh.org/browse?l=371chorales>

## KernScores

Local Search:  Pitch  ☐ anchored

[top](#)>[users](#)>[craig](#)>[classical](#)>[bach](#)>[371chorales](#)> [A](#) [a](#)

Four-part chorales collected after J.S. Bach's death by his son C.P.E. Bach (and finished by Kimberger, J.S. Bach student, after C.P.E. Bach's death). Ordered by Breitkopf & Härtel numbers, and includes all chorales except #150 which is not 4-part. First complete edition by Breitkopf & Härtel from 1784-1787 in four volumes. [First incomplete edition consisting of 200 chorales in two volumes by Friedrich Wilhelm Bimstiel in 1765 & 1769 which was reprinted in 1975 by Georg Olms]. This digital edition is referenced against the fourth edition of the chorales by Breitkopf & Härtel, c. 1875:

371 vierstimmige Choralgesänge von Johann Sebastian Bach. 4th ed. by Alfred Dörfel. Breitkopf & Härtel, Leipzig [c. 1875]. 178 pp. Plate Number: v.a. 10. Retypeset c. 1915 as Edition Breitkopf 10. Reprinted by Associated Music Publishers, Inc., New York [c. 1940].

Scans of the source edition can be viewed by clicking on the [S](#) button to the left of each chorale title. See [this chorale bibliography](#) at the Riemenschneider Bach Institute at Baldwin Wallace College for a good publication history of the Bach chorales. See also this article: [The History of the Breitkopf Collection of J.S. Bach's Four-Part Chorales](#) by Thomas Braatz. Click on the [Z](#) button below to download all Humdrum files in a single ZIP file.

[Z](#) [S](#)

All chorales in grand-staff notation (177 pages) [7.8 MB]

[S](#)

All chorales in vocal-score notation (254 pages) [8.8 MB]

[S](#) [H](#) [M](#) [K](#)

1. [Aus meines Herzens Grunde](#), BWV 269

[S](#) [H](#) [M](#) [K](#)

2. [Ich dank dir, lieber Herre](#), BWV 347

[S](#) [H](#) [M](#) [K](#)

3. [Ach Gott vom Himmel sieh darein](#), BWV 347

[S](#) [H](#) [M](#) [K](#)

4. [Es ist das Heil uns kommen her](#), BWV 86/6

[S](#) [H](#) [M](#) [K](#)

5. [An Wasserflüssen Babylon](#), BWV 267

[S](#) [H](#) [M](#) [K](#)

6. [Christus, der ist mein Leben](#), BWV 281

[S](#) [H](#) [M](#) [K](#)

7. [Nun lob, mein Seel, den Herren](#), BWV 17/7

[S](#) [H](#) [M](#) [K](#)

8. [Freuet euch, ihr Christen alle](#), BWV 40/8

[S](#) [H](#) [M](#) [K](#)

9. [Ermunter dich, mein schwacher Geist](#), BWV 248/12

[S](#) [H](#) [M](#) [K](#)

10. [Aus tiefer Not schrei ich zu dir](#), BWV 38/6 (Phrygian)

[S](#) [H](#) [M](#) [K](#)

11. [Jesu, nun sei gepreiset](#), BWV 41/6 & 171/6

[S](#) [H](#) [M](#) [K](#)

12. [Puer natus in Bethlehem](#), BWV 62/5

## KernScores

1. [Aus meines Herzens Grunde](#), BWV 269


Location	<a href="#">top</a> > <a href="#">users</a> > <a href="#">craig</a> > <a href="#">classical</a> > <a href="#">bach</a> > <a href="#">371chorales</a>
Humdrum file	<a href="#">chor001.krn</a> <a href="#">[S]</a> <a href="#">[expanded repeats]</a> <a href="#">[S]</a> <a href="#">[no repeats]</a> <a href="#">[S]</a>
Composer	Bach, Johann Sebastian
Composer's dates	21 Feb 1685 - 28 Jul 1750
Title: orig. lang.:	Aus meines Herzens Grunde
German	
Title: English	From the Depths of My Heart
Scholarly cat. num.	BWV 269
Publisher's cat. #	1
Genre designation	chorale
Original document	371 vierstimmige Choralgesänge von Johann Sebastian Bach, 4th ed. by Alfred Dörfel (Leipzig: Breitkopf und Härtel, c.1875). 178 pp. Plate "V.A.10". reprint: J.S. Bach, 371 Four-Part Chorales (New York: Associated Music Publishers, Inc., c.1940).
Manuscript source name	B&H, 4th ed, Alfred Dörfel, c.1875, plate V.A.10
Electronic Editor	Craig Stuart Sapp
Electronic edition version	2009/05/22
Current Checksum	909510096

Data Format	PDF Score	<a href="#">chor001.pdf</a>
Translations	Standard MIDI File:	<a href="#">chor001.mid</a> <a href="#">[with repeats]</a>
	Director Musices:	<a href="#">chor001.mus</a>
	Melisma Format:	<a href="#">chor001.notes</a>
	MusicXML:	<a href="#">chor001.xml</a>
	STK/SKIN:	<a href="#">chor001.ski</a>
	Guido:	<a href="#">chor001.gmn</a> <a href="#">[not on via noteserver.org]</a>
	ABC+:	<a href="#">chor001.abc</a> <a href="#">[not on via abcm2ps]</a> <a href="#">[number every bar]</a>
	MuseData:	<a href="#">chor001.md2</a> <a href="#">[not on via muse2ps]</a>
	SA Sonorities:	<a href="#">chor001.dat</a>
	MEI:	<a href="#">chor001.mei</a>

**Aus meines Herzens Grunde.**


1.

# Josquin Research Project



## The Josquin Research Project

Search, browse, and analyze complete scores of polyphonic music, ca. 1420–ca. 1520



### QUICK BROWSE

All Composers ▾

All Genres ▾

Enter Title

Browse

### Sample Work: Josquin, Pensif mari


mp3 ▶

Pensif mari Josquin des Prez? NJE 27.30

Superius






















Tenor

Contra



### RECENTLY ADDED

Click the title of any piece for work-specific search and analysis tools.

Composer	Title	Scores	MP3
Martini	O intemerata	 	
Martini	Quare fremuerunt gentes	 	
Martini	Qui confidunt	 	
Martini	Sepe expugnaverunt me	 	
Martini	Salve regina	 	
Martini	Sanctorum meritis	 	
Martini	Vexilla regis	 	


### JRP NEWS and updates

The JRP database has passed the **1-million-note mark**.

JRP editions were used by **Cut Circle** in a **recent performance** of Brumel's twelve-voice **Earthquake Mass** (Musica Sacra festival, Maastricht, the Netherlands)

Now available with complete text: all **four late cyclic masses** of Guillaume Du Fay.

[more on Facebook](#)



This repository Search

Explore Gist Blog Help

craigsapp + - ⚙️ 🔍

josquin-research-project / jrp-scores

Unwatch ▾ 2 ★ Unstar 4 Fork 0

64 commits 1 branch 0 releases 1 contributor

branch: master jrp-scores / +

Added Isaac scores to the database.

craigsapp authored 28 days ago latest commit 4ca9b3728a

Agr	Added Bru and Gas repositories and updated josquin.stanford.edu links...	6 months ago
Ano	Updated for new works.	a year ago
Bru	Added Bru and Gas repositories and updated josquin.stanford.edu links...	6 months ago
Bus	Added Bru and Gas repositories and updated josquin.stanford.edu links...	6 months ago
Com	Added Bru and Gas repositories and updated josquin.stanford.edu links...	6 months ago
Duf	Updated works; added Isaac to composer list.	4 months ago
Gas	Added Bru and Gas repositories and updated josquin.stanford.edu links...	6 months ago
Isa	Added Isaac scores to the database.	28 days ago
Jap	Updated works; added Isaac to composer list.	4 months ago
Jos	Updated works; added Isaac to composer list.	4 months ago
Mar	Updated works; added Isaac to composer list.	4 months ago
Mou	Adding all composers' repositories.	a year ago
Obr	Updated for new works.	a year ago
Ock	Updated works; added Isaac to composer list.	4 months ago
Ort	Updated works; added Isaac to composer list.	4 months ago
Pip	Updated works; added Isaac to composer list.	4 months ago
Reg	Added Bru and Gas repositories and updated josquin.stanford.edu links...	6 months ago
Rue	Updated works; added Isaac to composer list.	4 months ago
Tin	Updated works; added Isaac to composer list.	4 months ago

Code

Issues 0

Pull Requests 0

Pulse

Graphs

HTTPS clone URL

<https://github.com/josquin-research-project/jrp-scores>

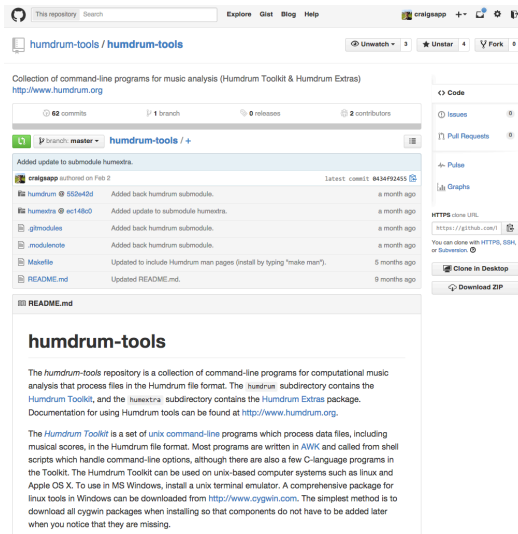
You can clone with HTTPS, SSH, or Subversion.

Clone in Desktop

Download ZIP

<https://github.com/josquin-research-project/jrp-scores>

# Github



- Install (unix) command-line utilities for procesing Humdrum data from Github

- Github repository for Humdrum tools:

<https://github.com/humdrum-tools/humdrum-tools>

- Github repository for Humdrum data (taken from <http://kern.humdrum.org> website):

<https://github.com/humdrum-tools/humdrum-data>

# Virtual Humdrum

- Online bash shell for running Humdrum tool commands.
- Slow, but allows testing against your installation and easier than installing in Windows with cygwin

<http://runnable.com/VD9ZirF3Zp1gkPZM/humdrum-for-shell-and-bash>

The screenshot shows the Runnable web interface for Humdrum. At the top, there's a purple header with the 'runnable' logo and a search bar. Below the header, the title 'Humdrum [shell and bash]' is displayed, followed by a description: 'Forked from Basic Shell Example.' and statistics: '32 Runs', '86 Views', and '6 Copies'. A brief description states: 'Command-line tools for music analysis. A virtual installation of https://github.com/humdrum-tools/humdrum-tools.' Below this, there are buttons for 'Run', 'Settings', 'Like', 'Share', and 'Save Draft'. A file manager section shows two files: 'main.sh' and 'README.md'. The main content area is titled 'Virtual Humdrum' and contains instructions: 'Try a Humdrum command in the example bash script or on the command line below:'. It provides two example commands: 'humcat h://chorales/chor001.krn | census -k' and 'humcat h://beethoven/sonatas/sonata01-1.krn | key', with an 'or' in between, followed by 'keycor h://beethoven/sonatas/sonata01-1.krn'.

## Terminal

```
root@runnable:~# humcat h://chorales/chor001.krn | census -k
HUMDRUM DATA

Number of data tokens:      412
Number of null tokens:     91
Number of multiple-stops:  0
Number of data records:    103
Number of comments:        17
Number of interpretations:  14
Number of records:         134

KERN DATA

Number of note-heads:      229
Number of notes:           223
Longest note:              2.
Shortest note:             8
Highest note:              dd
Lowest note:               FF#
Number of rests:           0
Maximum number of voices:  4
root@runnable:~# keycor h://chorales/chor001.krn
The best key is: G Major
root@runnable:~#
```

# Example problem

- Examine the trend in duple v. triple meters (mensurations) in early renaissance music

<http://josquin.stanford.edu/analysis/rhythm>

## Rhythmic Patterns in Works of Josquin des Prez

This page lists every rhythmic pattern that starts at the beginning of a perfection and lasts exactly one breve (or, under some mensuration signs, one long), along with information about the frequency of each pattern. Click on any pattern for a list of voices/measures in which it appears.

Cut-C	Circle	3, Cut-C3, 3/2, Circle/3	Cut-Circle
32823	2815	1361 (18.9%)	150
21082 (16.1%)	1080 (7.8%)	1213 (16.8%)	143 (9.6%)
20432 (15.6%)	884 (6.4%)	1056	79 (5.3%)
7084 (5.4%)	460 (3.3%)	765 (10.6%)	56 (3.8%)
5392 (4.1%)	396 (2.8%)	503 (7%)	48 (3.2%)
5293 (4%)	290 (2.1%)	466 (6.5%)	37 (2.5%)
4758 (3.6%)	287 (2.1%)	410 (5.7%)	37 (2.5%)

<http://museinfo.sapp.org/examples/humdrum/menpat.cpp>

# Metric rhythm patterns

Missa De beata virgine  
2. Gloria

Josquin/La Rue?  
NJE 3.3

Superius

Altus

Tenor

Bassus

v01 menCutC :: w\_w  
v01 menCutC :: md\_q\_w  
v01 menCutC :: w\_w  
v01 menCutC :: wr\_w  
v01 menCutC :: md\_q\_m\_m  
v01 menCutC :: tq\_q\_q\_q\_w

v03 menCutC :: br  
v03 menCutC :: br  
v03 menCutC :: w\_w  
v03 menCutC :: md\_q\_w  
v03 menCutC :: w\_w  
v03 menCutC :: wr\_w

v02 menCutC :: wd\_m  
v02 menCutC :: w\_w  
v02 menCutC :: wd\_m  
v02 menCutC :: m\_m\_m\_m  
v02 menCutC :: tm\_md\_q\_q\_q  
v02 menCutC :: b

v04 menCutC :: br  
v04 menCutC :: br  
v04 menCutC :: wd\_m  
v04 menCutC :: w\_w  
v04 menCutC :: w\_w  
v04 menCutC :: w\_w

[menpat -v jrp://Jos0303b](http://menpat-v.jrp://Jos0303b)

# Metric rhythm patterns (3)

```
menpat * | sed 's/.*://' | sort | uniq -c | sort -nr
```

```
186206 menCutC
17806 menCircle
4868 men3
3608 menC
2241 menC2
1878 menCircle2
1866 menCutC3
1688 menCutCircle
1486 menCircleOver3
336 menCircleDot
320 menC3
302 men3Over2
274 menCutC2
162 m(C|/3)
140 m(C|/2)
125 menCDot
114 men2
100 m(O|3)
80 menCutCircle3Over2
70 menReverseC
60 m(O3)
```

`menpat *`

→ extract mensural patterns

`sed 's/.*://'`

→ remove from “:” to end of line

`sort`

→ sort lines alphabetically

`uniq -c`

→ remove duplicates lines, counting  
number of duplicates

`sort -nr`

→ sort lines in reverse numeric order



# Metric rhythm patterns (4)

```
menpat Jos/* | grep -Pv "\s[^\s]*r\s*$" | sed 's/.*://' | sortcount -ph
```

```
**pcent **data
82.33  menCutC
8.05   menCircle
2.34   men3
1.56   menC
1.15   menC2
0.99   menCircle2
0.88   menCutC3
0.83   menCutCircle
0.7    menCircleOver3
0.18   menCircleDot
0.16
0.14   menCutC2
0.14   menC3
0.12   men3Over2
0.07   m(C|/2)
0.07   m(C|/3)
0.06   menCDot
0.05   men2
0.05   m(O|3)
0.04   menCutCircle3Over2
0.04   menReverseC
0.03   m(O3)
0
*_    *_
```

`grep -Pv "\s[^\s]*r\s*$"` → remove measures with full-measure rest.

`sortcount -ph` → similar to `sort | uniq -c | sort -nr`  
`-p` = show counts as percentages  
`-h` = format data in Humdrum syntax

# Metric rhythm patterns (5)

```
menpat Ock/* | grep -Pv "\s[^\s]*r\s*$" | sed 's/:.*//' | sortcount -ph
```

Ockeghem:

**pcent	**data
50.98	menCutC
32.3	menCircle
13.47	menC
1.06	menCDot
1.02	menCutCircle
0.5	men3
0.31	m(O3)
0.15	men2
0.07	m(C .)
0.06	m(C. )
0.06	menCircle2
0.02	menReverseC
0.01	menCircleDot
*_	*_

Josquin:

**pcent	**data
82.33	menCutC
8.05	menCircle
2.34	men3
1.56	menC
1.15	menC2
0.99	menCircle2
0.88	menCutC3
0.83	menCutCircle
0.7	menCircleOver3
0.18	menCircleDot
0.16	
0.14	menCutC2
0.14	menC3
0.12	men3Over2
0.07	m(C /2)
0.07	m(C /3)
0.06	menCDot
0.05	men2
0.05	m(O 3)
0.04	menCutCircle3Over2
0.04	menReverseC
0.03	m(O3)
0	
*_	*_

# Metric rhythm patterns (6)

- Separate JRP data files by genre:

```
(mkdir songs; cd songs; humsplit h://jrp/Zso)
```

```
(mkdir songs; cd motets; humsplit h://jrp/Zmo)
```

```
(mkdir songs; cd masses; humsplit h://jrp/Zma)
```

```
menpat motets/*.krn | grep -Pv "\s[^\s]*\s*$" | sed  
's/:.*//' | sortcount -ph
```

**pcent	**data
86.73	menCutC
4.87	menCircle
2.55	men3
2.43	menC2
0.97	menCircleOver3
0.85	menC
0.4	menCircle2
0.2 6	menCutC3
0.16	menCutC2
0.15	menCircleDot
0.14	men3Over2
0.14	menCutCircle
0.07	menC3
0.01	menCDot
*_	*_

## Motets:

**pcent	**data
86.73	menCutC
4.87	menCircle
2.55	men3
2.43	menC2
0.97	menCircleOver3
0.85	menC
0.4	menCircle2
0.26	menCutC3
0.16	menCutC2
0.15	menCircleDot
0.14	men3Over2
0.14	menCutCircle
0.07	menC3
0.01	menCDot
*_	*_

## Masses:

**pcent	**data
52.87	menCutC
18.92	menCircle
9.23	menC
8.7	menC2
3.66	men3
2.2	menCutCircle
1.31	menCutC3
1.01	menCircle2
0.5	menC3
0.45	menCircleOver3
0.31	menCircleDot
0.29	menCDot
0.08	men2
0.08	m(C /2)
0.08	m(C /3)
0.07	menReverseC
0.06	m(O 3)
0.05	menCutC2
0.03	men3Over2
0.02	menCutCircle3Over2
0.01	m(C .)
0.01	m(C. )
*_	*_

# Metric rhythm patterns (7)

```
menpat songs/Ock*.krn | grep -Pv "\s[^\s]*r\s*$" | sed 's/:.*/' | sortcount -ph
```

**pcent	**data
63.93	menCutC
19.02	menCircle
14.24	menC
2.81	m(O3)
*_	*_

**pcent	**data
93.84	menCutC
2.17	menC2
1.29	menCircle
1.25	menC
1.18	menCutC3
0.22	menCutC2
0.04	men3
*_	*_

```
menpat songs/Jos*.krn | grep -Pv "\s[^\s]*r\s*$" | sed 's/:.*/' | sortcount -ph
```